

Normal adaptations to exercise despite protection against oxidative stress

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Source

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Abstract

It has been reported that supplementation with the antioxidant vitamins C and E prevents the adaptive increases in mitochondrial biogenesis and GLUT4 expression induced by endurance exercise. We reevaluated the effects of these antioxidants on the adaptive responses of rat skeletal muscle to swimming in a short-term study consisting of 9 days of vitamins C and E with exercise during the last 3 days and a longer-term study consisting of 8 wk of antioxidant vitamins with exercise during the last 3 wk. The rats in the antioxidant groups were given 750 mg·kg body wt⁽⁻¹⁾·day⁽⁻¹⁾ vitamin C and 150 mg·kg body wt⁽⁻¹⁾·day⁽⁻¹⁾ vitamin E. In rats euthanized immediately after exercise, plasma TBARs were elevated in the control rats but not in the antioxidant-supplemented rats, providing evidence for an antioxidant effect. In rats euthanized 18 h after exercise there were large increases in insulin responsiveness of glucose transport in epitrochlearis muscles mediated by an approximately twofold increase in GLUT4 expression in both the short- and long-term treatment groups. The protein levels of a number of mitochondrial marker enzymes were also increased about twofold. Superoxide dismutases (SOD) 1 and 2 were increased about twofold in triceps muscle after 3 days of exercise, but only SOD2 was increased after 3 wk of exercise. There were no differences in the magnitudes of any of these adaptive responses between the control and antioxidant groups. **These results show that very large doses of antioxidant vitamins do not prevent the exercise-induced adaptive responses of muscle mitochondria, GLUT4, and insulin action to exercise and have no effect on the level of these proteins in sedentary rats.**